TRC
Customer-Focused Solutions

April 30, 2004

California Regional Water Quality Control Board
Los Angeles Region
320 West 4th Street, Suite 200
Los Angeles, California 90013

ATTN: MR. NOMAN CHOWDHURY

SITE: 76 STATION 6907
11025 EAST WASHINGTON BOULEVARD
WHITTIER, CALIFORNIA
FILE NO. R-11066

RE: SITE CONCEPTUAL MODEL UPDATE
JANUARY THROUGH MARCH 2004

Dear Mr. Chowdhury:

On behalf of ConocoPhillips Company, TRC submits this Site Conceptual Model Update, which includes the Quarterly Monitoring Report, for 76 Station 6907. The Preliminary Site Conceptual Model for this site was submitted on April 15, 2002.

1.0 INTRODUCTION

The objective of this report is to present a written and graphical representation of the petroleum hydrocarbon release at the site so that potential receptors may be identified. Site-specific geologic and chemical data will be presented in the context of regional hydrogeology in order to attempt to identify how the distribution of chemicals is changing in space and time.

2.0 BACKGROUND

2.1 SITE DESCRIPTION

The site is an active service station located on the northwest corner of the intersection of East Washington and Norwalk Boulevards in Whittier, California. The station maintains two 12,000-gallon gasoline underground storage tanks (USTs), one 10,000-gallon diesel UST, and five dispenser islands with associated product piping. All tanks are of single-walled plasteel construction installed in 1983 with tank top upgrades performed in 1993 (TRC, 2002a).

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The surrounding area is a combination of residential and commercial properties. The adjacent properties include residential dwellings to the immediate north and west of the site. The houses to the west are located on Morrill Avenue, a small street ending in a cul-de-sac. Across Washington Boulevard to the south of the site is located the Community of Grace Brethren Church and School. To the east of the site, across Norwalk Boulevard is the Santa Fe Springs Market Place, a retail shopping center (TRC, 2002a).

2.2 SITE GEOLOGY AND HYDROGEOLOGY

The site is located approximately 0.5 mile east of the San Gabriel River. The site located at an elevation of approximately 160 feet above mean sea level. The topography in the area of the site slopes gently toward the south (United States Geological Survey [USGS], 1966).

The site is located within the San Gabriel River flood plain of the Montebello Forebay Area. The Montrbello Fore Bay Area extends from the Merced Hills in the north to Downey in the south, and from the Puente Hills and Santa Fe Springs to the east to Pico Rivera in the west. Recent Alluvium is present beneath the site from grade to approximately 120 feet below grade (fbg). Included in the Recent Alluvium is the Gaspur Aquifer (approximately 80 feet thick) (California Department of Water Resources [DWR], 1961).

The Recent Alluvium unconformably overlies the Lakewood Formation, which is approximately 50 feet thick in the area of the site. The Lakewood Formation unconformably overlies the San Pedro Formation. The San Pedro Formation contains the Lynwood Aquifer (approximately 100 feet thick); an unnamed aquiclude (approximately 50 feet thick); the Silverado Aquifer (approximately 120 feet thick); a second unnamed aquiclude (approximately 50 feet thick); and the Sunnyside Aquifer which extends to an unknown depth (DWR, 1961).

The La Habra Syncline is located approximately 0.75-mile southeast of the site and extends from Whittier west to La Habra. The eastern end of the Puente Hills and the Whittier Fault Zone are located approximately 2.25-miles northeast of the site. The Whittier Fault Zone trends to the southeast and locally offset the aquifers in the Lakewood Formation (DWR, 1961).

According to information provided by the Los Angeles County Department of Public Works, the Water Replenishment District, and the City of Whittier, there are 14 public supply wells within a one-mile radius of the service station.

2.3 SITE HISTORY

In September 1993, eight hand-auger borings (HA-1 through HA-8) were drilled in the vicinity of the product lines and dispenser islands, and eight hollow-stem auger borings (B-1 through B-8) were drilled in the vicinity of the gasoline and diesel USTs. Three of the borings were converted to groundwater monitoring wells (MW-1 through MW-3). Laboratory analysis of soil samples indicated the presence of adsorbed-phase hydrocarbons (maximum concentrations: 8,400 milligrams per kilogram [mg/kg] total petroleum hydrocarbons as gasoline [TPH-G] and 32 mg/kg benzene) (Georesearch, 1993).

In February 1998, UST top upgrade and dispenser/product line replacement activities were conducted at the site. Laboratory analysis of soil samples collected from the dispenser island and product line areas indicated the presence of adsorbed-phase hydrocarbons (maximum concentrations of: 35,300 mg/kg TPH-G, 16,000 mg/kg total petroleum hydrocarbons as diesel [TPH-D], 47 mg/kg benzene, and 76 mg/kg methyl tertiary butyl ether [MTBE]) (Alton Geoscience, 1998).

In March 1999, Monitoring Wells MW-4 through MW-7 were drilled and installed along the southern and eastern property boundaries. Results of laboratory analysis of soil samples indicated the presence of adsorbed-phase hydrocarbons in soil samples collected from Monitoring Wells MW-4 and MW-5 (maximum concentrations: 150 mg/kg TPH-G, 37 mg/kg TPH-D, 0.66 mg/kg benzene, and 0.75 mg/kg MTBE). No detectable concentrations of TPH-G, TPH-D, benzene, or MTBE were present in soil samples collected from Monitoring Wells MW-6 and MW-7 (Alton Geoscience, 1999).

In September 2000, Monitoring Wells MW-4D, MW-5D, MW-8D, MW-9, MW-10, and MW-10D were installed. Monitoring Wells MW-4D, MW-5D, and MW-9 were installed adjacent to existing Monitoring Wells MW-4, MW-5, and MW-2, respectively. Monitoring Well MW-8D was installed west of the USTs along the western property boundary and Monitoring Wells MW-10 and MW-10D were installed south of the site in Washington Boulevard. Results of laboratory analysis of soil samples indicated the presence of adsorbed-phase hydrocarbons in soil samples collected from Monitoring Wells MW-4D, MW-5D, MW-8D, and MW-9. Maximum concentrations of 22,000 mg/kg TPH-G, 14 mg/kg benzene, and 35 mg/kg MTBE were detected during this investigation. No detectable concentrations of TPH-G, benzene, or MTBE were present in soil samples collected from Monitoring Wells MW-10 and MW-10D (TRC, 2000).

In September 2002, groundwater Monitoring Wells MW-6D, MW-11 and MW-12, and Vapor Wells VW-1, VW-2, VW-3, and VW-4 were drilled and installed to further assess the lateral extent of dissolved-phase hydrocarbons beneath the site and to facilitate the proposed remedial testing activities at the site. In addition, Monitoring Wells MW-1, MW-2, and MW-3 were drilled out and reinstalled in the same boreholes with screened intervals from approximately 40 to 60 fbg. These wells were re-numbered as Monitoring Wells MW-1D, MW-2D, and MW-3D. These wells appeared to be previously screened through two different water-bearing zones. (TRC, 2002b).

In October 2002, shallow screened groundwater Monitoring Wells MW-13 and MW-14 were installed in Washington Boulevard southwest of the site and west of the site in Morrill Avenue, respectively (see Figure 2). In addition, an attempt to install the shallow groundwater monitoring well previously proposed in Norwalk Boulevard was conducted. Due to numerous underground utilities it was not possible to install the proposed groundwater monitoring well in this area (TRC, 2002e).

In October 2002, groundwater pumping tests were conducted from the lower groundwater bearing zone beneath the site (high permeability soils from approximately 40 to 60 fbg). Groundwater pumping tests indicated an estimated hydraulic conductivity ranging from 1.02 X 10^{-3} to 1.17 X 10^{-3} centimeters per second. The pumping rates needed to induce drawdown in the pumping wells and the lack of drawdown in observation wells during the pumping tests performed at the site suggest that the wells screened in the lower groundwater bearing zone have a very small radius of influence and would have to be pumped at a very high rate to create a capture zone at the site (TRC, 2002c).

In October 2002, vapor extraction tests were conducted using Vapor Wells VW-1 through VW-4 and the shallow onsite monitoring wells. Dual-phase extraction tests proposed at the site could not be conducted due to the absence of groundwater in shallow groundwater bearing zone beneath the site. Analysis of the distance versus vacuum relationships from the vapor extraction tests provided an average estimated radius of influence (ERI) of approximately 74 feet. The concentrations of vapors extracted during the vapor extraction tests, and observed vacuum flow relationships suggest that a significant mass of hydrocarbons may be recovered through vapor extraction (TRC, 2002c).

In January and February 2003, two one-week-long, soil vapor extraction events were conducted at the site. A total of 2, 018 pounds of hydrocarbons were removed from the subsurface during these soil vapor extraction events (TRC, 2003a).

On June 2, 2003, Boring B-9 was drilled to a total depth of approximately 70 fbg using hollow stem auger drilling techniques. Boring B-9 was located approximately 3 feet north of Monitoring Well MW-11 near the gasoline UST area. No soil samples were collected during drilling activities. A total of five discrete depth groundwater samples were collected from depths of approximately 45, 50, 55, 60 and 65 fbg using Simulprobe™ techniques. Attempts to collect discrete depth groundwater samples at approximately 40 and 70 fbg were unsuccessful. On

June 3, 2003, Vapor Extraction Well VW-5 was installed in the dispenser island area (TRC, 2003b).

On September 24 through 26, and October 1 through 3, 2003, nested C-Sparge™ Points CS-1 through CS-10 were drilled and installed in the vicinity of the gasoline UST area and dispenser islands.

Two distinct soil types (low-permeability and higher-permeability) are present within the water bearing sediments at the site. Generally low-permeability soils are present in the horizon from approximately 10 to 40 fbg and generally higher-permeability soils are present in the horizon from approximately 40 to 62.5 fbg. Three different well screen intervals are now present at the site: Vapor Wells VW-1 through VW-4 are screened from approximately 3 to 15 fbg; Monitoring Wells MW-4 through MW-7, MW-9, and MW-10 through MW-14 are screened only in the upper low-permeability soils from approximately 15 to 40 fbg; and Monitoring Wells MW-1D through MW-6D, MW-8D, and MW-10D are screened in only the higher-permeability soils from approximately 40 to 60 fbg (TRC, 2002a and 2002e).

A quarterly fluid level monitoring and groundwater sampling program was initiated at the site in September 1993. Groundwater has been present in the shallow screen wells (screened from approximately 15 to 40 fbg) at depths ranging from approximately 21 to below the screen interval (dry) with a gradient directed toward the west/southwest. Groundwater has been present in the deep screen wells (screened from approximately 40 to 60 fbg) at depths ranging from approximately 26 to 44 fbg with a gradient directed toward the west/southwest. Changes in groundwater elevations between quarterly fluid level monitoring events have varied as much as 17 feet (TRC, 2003c).

3.0 PLUME CHARACTERIZATION AND RISK TO RECEPTORS

Based on the evaluation presented below, the primary sensitive receptor appears to be the Gaspur Aquifer, which is present beneath the site at approximately 40 to 120, fbg. However, the presence of other low-permeability layers is likely to retard any vertical migration of petroleum contaminants before the local drinking-water aquifers are impacted. Public supply wells located within a one-mile radius of the site have reported varying screened intervals ranging from 75 to 698 feet below grade. The presence of these wells poses a potential risk because these may act as conduits, depending on the specific well screen intervals, to deep aquifers. Moreover, the influence of well pumping may extend to the subject site in an aggressive pumping scenario (TRC, 2002a).

3.1 HYDROCARBON-AFFECTED SOIL EVALUATION

Two distinct soil types (low permeability and higher permeability) are present beneath the site. Generally low permeability soils are present in the horizon from approximately 10 to 40 fbg and generally higher permeability soils are present in the horizon from approximately 40 to 62.5 fbg (TRC, 2002a and 2002e).

Evidence of a hydrocarbon release was discovered when hydrocarbon-affected soil was encountered during the leak detection investigation conducted in 1993. It appears that the hydrocarbon release occurred in or surrounding the UST cavity. A maximum TPH-G concentration of 22,000 mg/kg was detected in this area (TRC, 2002a). Based on the results of site assessment activities conducted to date, it appears that the lateral extent of hydrocarbon-affected soil in this area has been adequately assessed (TRC, 2002e). Based on soil sampling data from dispenser and product line replacement activities, a possible second release may have occurred in the dispenser area sometime prior to February 1998. A maximum TPH-G concentration of 35,300 mg/kg was detected in this area. (TRC, 2002a).

3.2 LIQUID- AND DISSOLVED-PHASE HYDROCARBON EVALUATION

Since fluid level monitoring activities were initiated in September 1993, no liquid-phase hydrocarbons (LPH) have been observed in the groundwater monitoring wells installed at the site (TRC, 2003c).

Two different groundwater monitoring well screen intervals are now present the site: Monitoring Wells MW-4 through MW-7, MW-9, and MW-10 through MW-14 are screened only in the upper low permeability soils from approximately 15 to 40 fbg; and Monitoring Wells MW-1D through MW-6D, MW-8D, and MW-10D are screened in only the high permeability soils from approximately 40 to 60 fbg (TRC, 2002a and 2002e).

Based on fluid-level monitoring activities conducted during December 2002, March 2003, and June 2003, it appears that groundwater is again present in the shallow water-bearing zone. In addition, it appears that the previous absence of water in the shallow water-bearing zone (during fall of 2002) was the result of seasonal fluctuations (TRC, 2003c).

Based on groundwater sampling activities conducted in September and October 2003, it appears that the lateral extent of the dissolved-phase hydrocarbons in the shallow water-bearing zone has been adequately assessed in all directions. In addition, it appears that the lateral extent of dissolved-phase hydrocarbons in the deep water-bearing zone has also been assessed. Based on the results of the last four quarters of groundwater samples collected from deep zone Wells MW-1D, MW-2D, and MW-3D, it appears that the removal of cross-screened Wells MW-1, MW-2, and MW-3 has resulted in a reduction of dissolved-phase hydrocarbon concentrations detected in the deep water-bearing zone (TRC, 2003c).

Based on the results of discrete depth groundwater sampling activities conducted within the deep water-bearing zone it appears that:

- The deep water-bearing zone is present from approximately 40 to 70 fbg.
- The maximum dissolved-phase hydrocarbon concentrations are present in the deep water-bearing zone at approximately 45 fbg.
- Dissolved-phase hydrocarbon concentrations decrease with depth from approximately 45 to 65 fbg, at which point the dissolved-phase hydrocarbon concentrations increased (TRC, 2003b).

Existing dissolved-phase data are consistent with the interpretation that the fuel release occurred in or near the UST cavity with a possible secondary release in the dispenser area (TRC, 2002a). Maximum historic concentrations of TPH-G (140,000 micrograms per liter [ug/l]), benzene (17,000 ug/l), and MTBE (11,000 ug/l) have been detected in shallow-zone Well MW-9 (TRC, 2002a).

4.0 PLUME TRAVEL TIME ANALYSIS

The LARWQCB non-steady state analytical model was used to perform the plume travel time analysis. The model assumes a one-time instantaneous release scenario and requires at least one (preferably downgradient) well to have experienced a historic peak in dissolved methyl tertiary butyl ether (MTBE) or other contaminant. The user must perform a curve-fitting process to match the height and shape of the historic dissolved MTBE peak. The time at which the peak occurs relative to an estimated release date is also part of the curve-fitting process. The parameters that are adjusted to achieve the best-fit curve include the dispersivity, groundwater velocity and mass discharge, none of which have been empirically measured for this site. Copies of the input parameter spreadsheets and the curve-fitting results were included in the TRC Update to Plume Travel Time Report dated July 15, 2003. Based on the input parameters that were used to fit the historic dissolved MTBE peak, the model generates a 200-year concentration versus time plot for the production well, a specified distance from the contaminant source. For this site, Wells MW-5 and MW-5D were selected as the input wells for the shallow and deep aquifer zones, respectively, utilizing only dissolved phase MTBE data obtained by EPA Method 8260 (TRC, 2003d).

Starting in April 2003, the laboratory data collected from Well MW-5 indicates the beginning of a secondary dissolved-phase MTBE peak. Additional dissolved-phase MTBE data is required to assess if this peak is an anomalous data point or if a modification to the plume travel time model is necessary. Starting in April 2003, the laboratory data collected from Well MW-5D has exhibited a decreasing trend in dissolved-phase MTBE concentrations (TRC, 2003d).

The results of the updated model for the subject site indicate that dissolved-phase MTBE from the site will not impact the production well that is located approximately 2,110 feet from the site within the 200-year time frame predicted by the model. The small mass apparently released at the subject site combined with the estimated groundwater velocity of less than 0.019 ft/day (shallow zone) and 0.0209 ft/day (deep zone; consistent with the sandy, silty soil beneath the site) results in an insignificant threat to the production well (TRC, 2003d).

The major assumptions of the model are:

1. Non-steady state conditions (concentration varies with time)
2. Release occurred instantaneously and is finite
3. Homogeneous aquifer
4. No change in groundwater flow direction or velocity
5. Dispersion coefficients are constant
6. Natural degradation of contaminant is neglected.

For the subject site, the most serious assumptions are numbers 3, 4 and 6. Soil encountered beneath the site is not uniform and it is not expected that soil and aquifer properties would be homogeneous between the subject site and the production well. Although the flow direction is predominantly southward, the hydraulic gradient could change, spatially or temporally. The production well listed in the LARWQCB January 14, 2002 letter (02S11W19F01S) is located north of the site and is not directly downgradient. Therefore, for the model to be valid with the existing flow direction, aggressive pumping would be required to artificially draw the plume from the site towards this well. Lastly, ignoring the effects of natural degradation likely yields a worst-case scenario in terms of impact to the production well. It is probable that some or all of the dissolved-phase MTBE would degrade naturally during the 200-year model projection. With these assumptions is mind and given that the model yields what is likely a conservative prediction, the results obtained for this site suggest that the existing MTBE plume does not threaten the production well located 2,110 feet from the site (TRC, 2003d). An update to this analysis will be performed in July 2004, as required by the LARWQCB letter dated January 14, 2002.

5.0 ONGOING ACTIVITIES

5.1 PROGRESS THIS QUARTER

Design and permitting of the proposed vapor extraction and C-Sparge™ systems were continued. Fluid level monitoring and groundwater sampling activities were conducted at the site on February 26, 2004. A copy of the First Quarter 2004 Fluid Level Monitoring and Groundwater Sampling Report is attached.

5.2 PLANNED PROGRESS NEXT QUARTER

Design and permitting of the proposed vapor extraction and C-Sparge™ systems will be continued. Quarterly fluid level monitoring and groundwater sampling activities will continue at the site and site conceptual model updates will continue to be submitted.

If you have any questions or need additional information concerning this site, please contact me at (949) 753-0101, or Ms. Shari London with ConocoPhillips Company at (714) 428-7720.

Sincerely,

TRC

John Nordenstam, RG
Senior Project Geologist

ATTACHMENT: First Quarter 2004 Fluid Level Monitoring and Groundwater Sampling Report

cc: Ms. Shari London, ConocoPhillips Company (electronic copy only)

200377/6907R34.QSR

6.0 REFERENCES

Alton Geoscience, 1998, Soil Sampling Report for Tank Top Upgrade and Product Line Replacement, 76 Station 6907, 11025 East Washington Boulevard, Whittier, California, April 6.

Alton Geoscience, 1999, Supplementary Site Assessment Report, 76 Station 6907, 11025 East Washington Boulevard, Whittier, California, May 17.

California Department of Water Resources (DWR), 1961, Planned Utilization of the Groundwater Basins of the Coastal Plain of Los Angeles County, Appendix A: Groundwater Geology, June.

GeoResearch, 1993, Leak Detection Investigation Report, Unocal Service Station 6907, 11025 East Washington Boulevard, Whittier, California, November 19.

TRC, 2000, Supplementary Site Assessment Report, 76 Station 6907, 11025 East Washington Boulevard, Whittier, California, October 31.

TRC, 2002a, Preliminary Site Conceptual Model, Site Characterization and Interim Remedial Action Report and Workplan: 76 Station 6907, 11025 East Washington Boulevard, Whittier, California, April 15.

TRC, 2002b, Supplementary Site Assessment Report: 76 Station 6907, 11025 East Washington Boulevard, Whittier, California, October 15.

TRC, 2002c, Groundwater Pumping and Soil Vapor Extraction Test Report: 76 Station 6907, 11025 East Washington Boulevard, Whittier, California, October 15.

TRC, 2002d, Site Conceptual Model Update, July through September 2002: 76 Station 6907, 11025 East Washington Boulevard, Whittier, California, November 15.

TRC, 2002e, Well Installation Report: 76 Station 6907, 11205 East Washington Boulevard, Whittier, California, November 25.

TRC, 2003a, Vacuum Extraction Test Report, January and February 2003: 76 Station 6907, 11025 East Washington Boulevard, Whittier, California, March 17.

TRC, 2003b, Supplementary Site Assessment Report: 76 Station 6907, 11025 East Washington Boulevard, Whittier, California, June 27.

TRC, 2003c, Site Conceptual Model Update, July through September 2003: 76 Station 6907, 11025 East Washington Boulevard, Whittier, California, July 15.

TRC, 2003d, Update to Estimated Plume Travel Time Report: 76 Station 6907, 11025 East Washington Boulevard, Whittier, California, July 15.

TRC, 2003e, Addendum to Remedial Action Plan Dated January 10, 2003: 76 Station 6907, 11025 East Washington Boulevard, Whittier, California, August 25.

United States Geological Survey (USGS), 1966, Whittier Quadrangle, 7.5 minute series, photorevised 1981.

ATTACHMENT

QUARTERLY MONITORING REPORT

TRC

Customer-Focused Solutions

FIRST QUARTER 2004 FLUID LEVEL MONITORING AND GROUNDWATER SAMPLING REPORT

April 8, 2004

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